FIG. 1

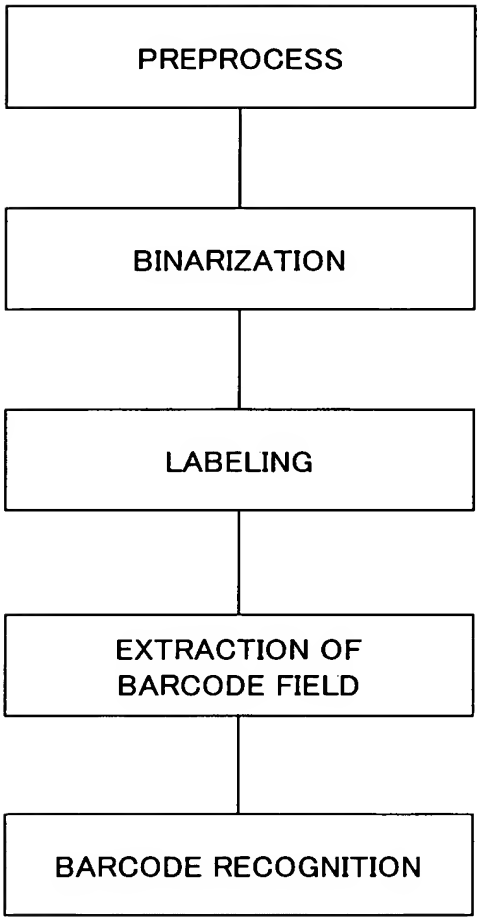

PREPROCESS
BINARIZATION
LABELING
EXTRACTION OF BARCODE FIELD
BARCODE RECOGNITION

FIG. 2

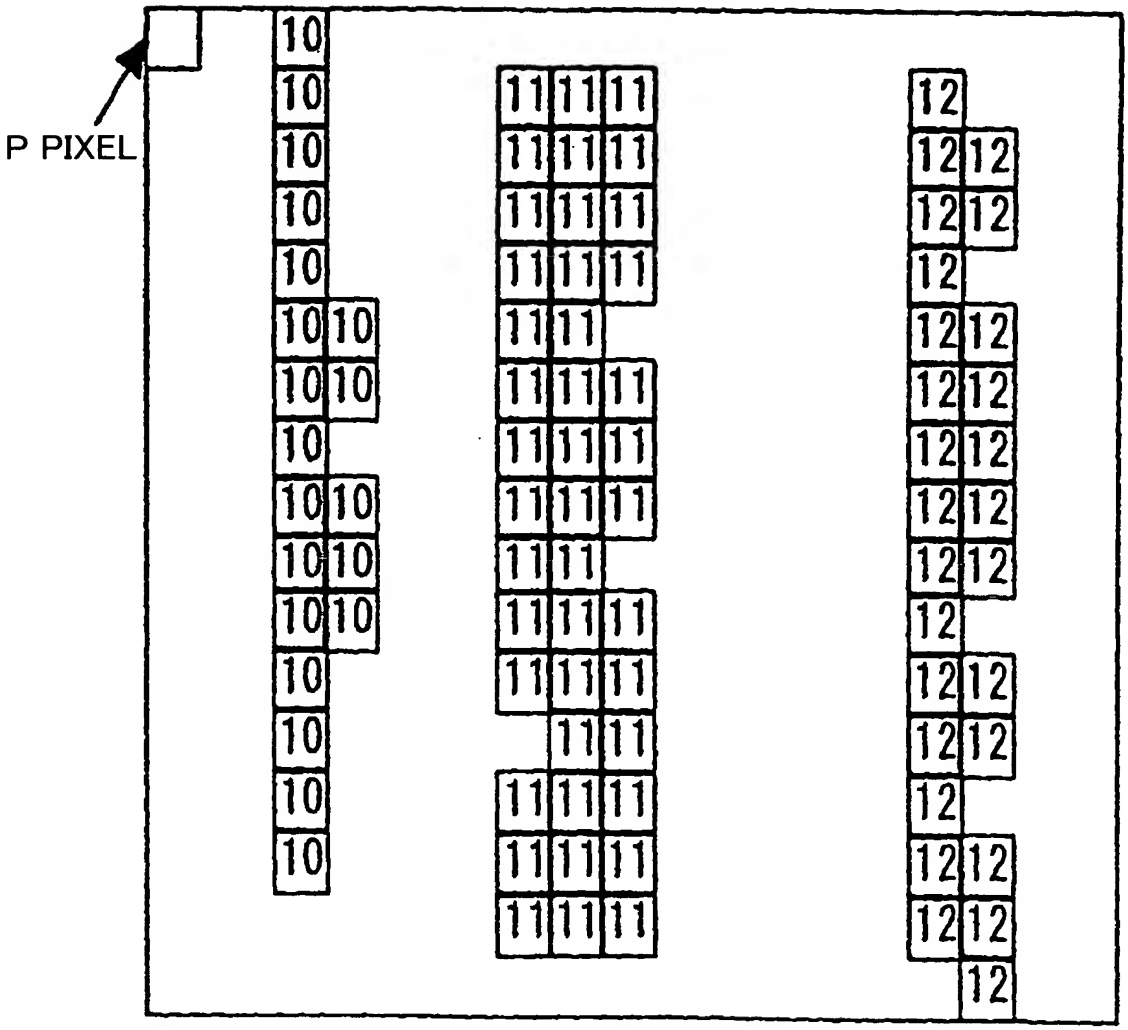


FIG. 3

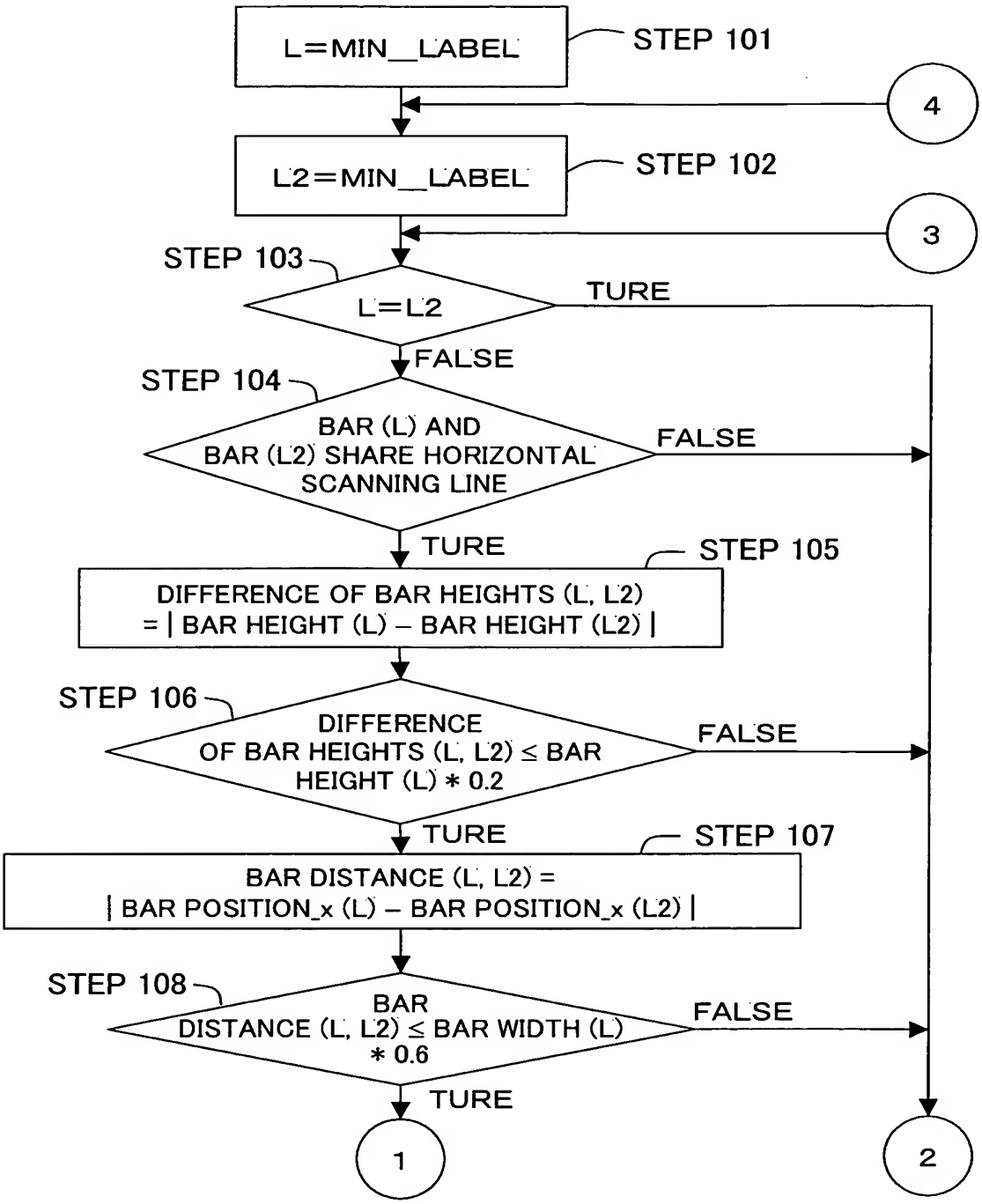

L=MIN_LABEL
STEP 101
4
L2=MIN_LABEL
STEP 102
3
STEP 103
L=L2
TURE
FALSE
STEP 104
BAR (L) AND BAR (L2) SHARE HORIZONTAL SCANNING LINE
FALSE
TURE
STEP 105
DIFFERENCE OF BAR HEIGHTS (L, L2) = | BAR HEIGHT (L) – BAR HEIGHT (L2) |
STEP 106
DIFFERENCE OF BAR HEIGHTS (L, L2) ≤ BAR HEIGHT (L) * 0.2
FALSE
TURE
STEP 107
BAR DISTANCE (L, L2) = | BAR POSITION_x (L) – BAR POSITION_x (L2) |
STEP 108
BAR DISTANCE (L, L2) ≤ BAR WIDTH (L) * 0.6
FALSE
TURE
1
2

FIG. 4

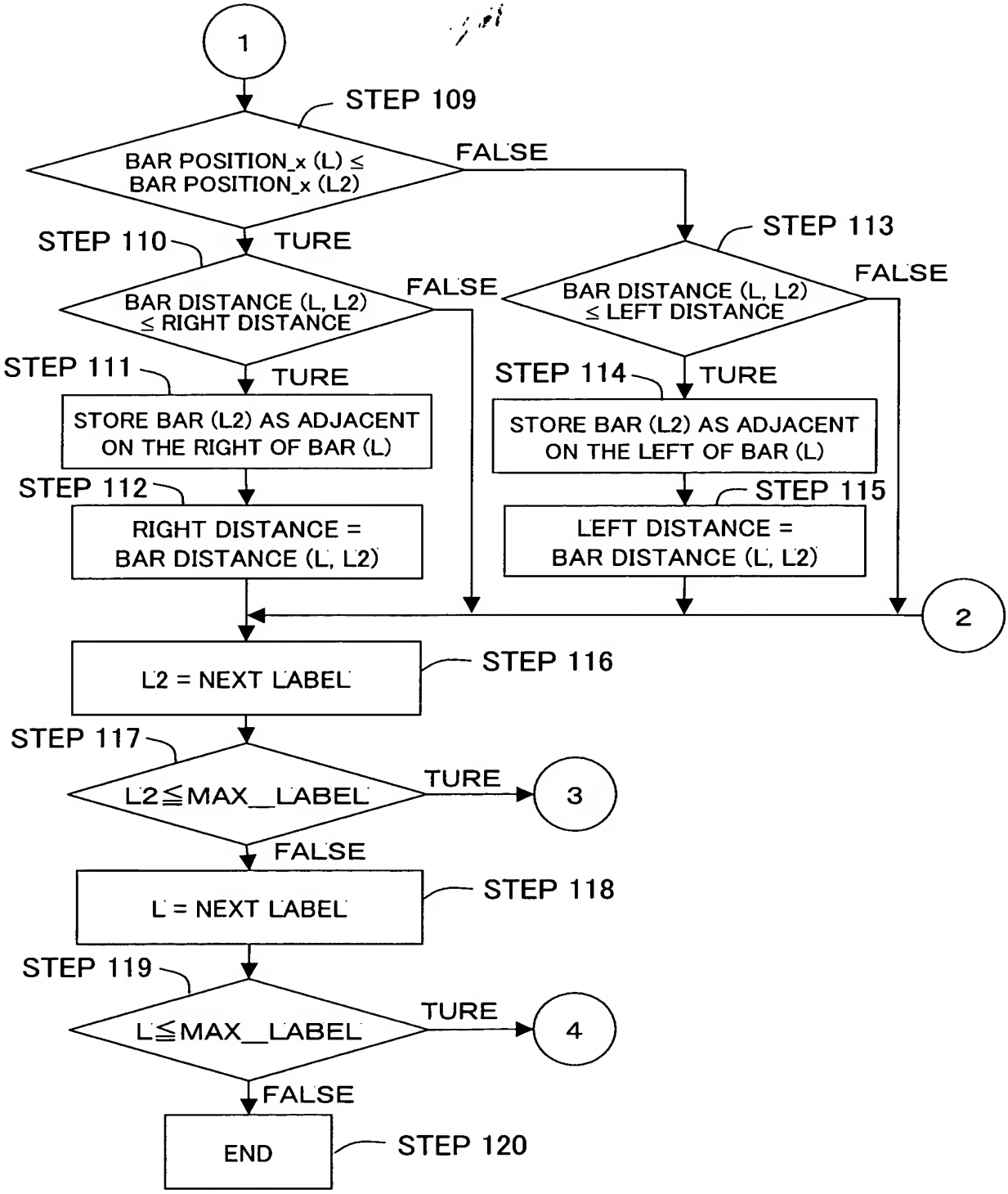

1
STEP 109
BAR POSITION_x (L) ≤ BAR POSITION_x (L2)
FALSE
TURE
STEP 110
BAR DISTANCE (L, L2) ≤ RIGHT DISTANCE
FALSE
TURE
STEP 111
STORE BAR (L2) AS ADJACENT ON THE RIGHT OF BAR (L)
STEP 112
RIGHT DISTANCE = BAR DISTANCE (L, L2)
STEP 113
BAR DISTANCE (L, L2) ≤ LEFT DISTANCE
FALSE
TURE
STEP 114
STORE BAR (L2) AS ADJACENT ON THE LEFT OF BAR (L)
STEP 115
LEFT DISTANCE = BAR DISTANCE (L, L2)
2
L2 = NEXT LABEL
STEP 116
STEP 117
L2≦MAX_LABEL
TURE
3
FALSE
L = NEXT LABEL
STEP 118
STEP 119
L≦MAX_LABEL
TURE
4
FALSE
END
STEP 120

FIG. 5

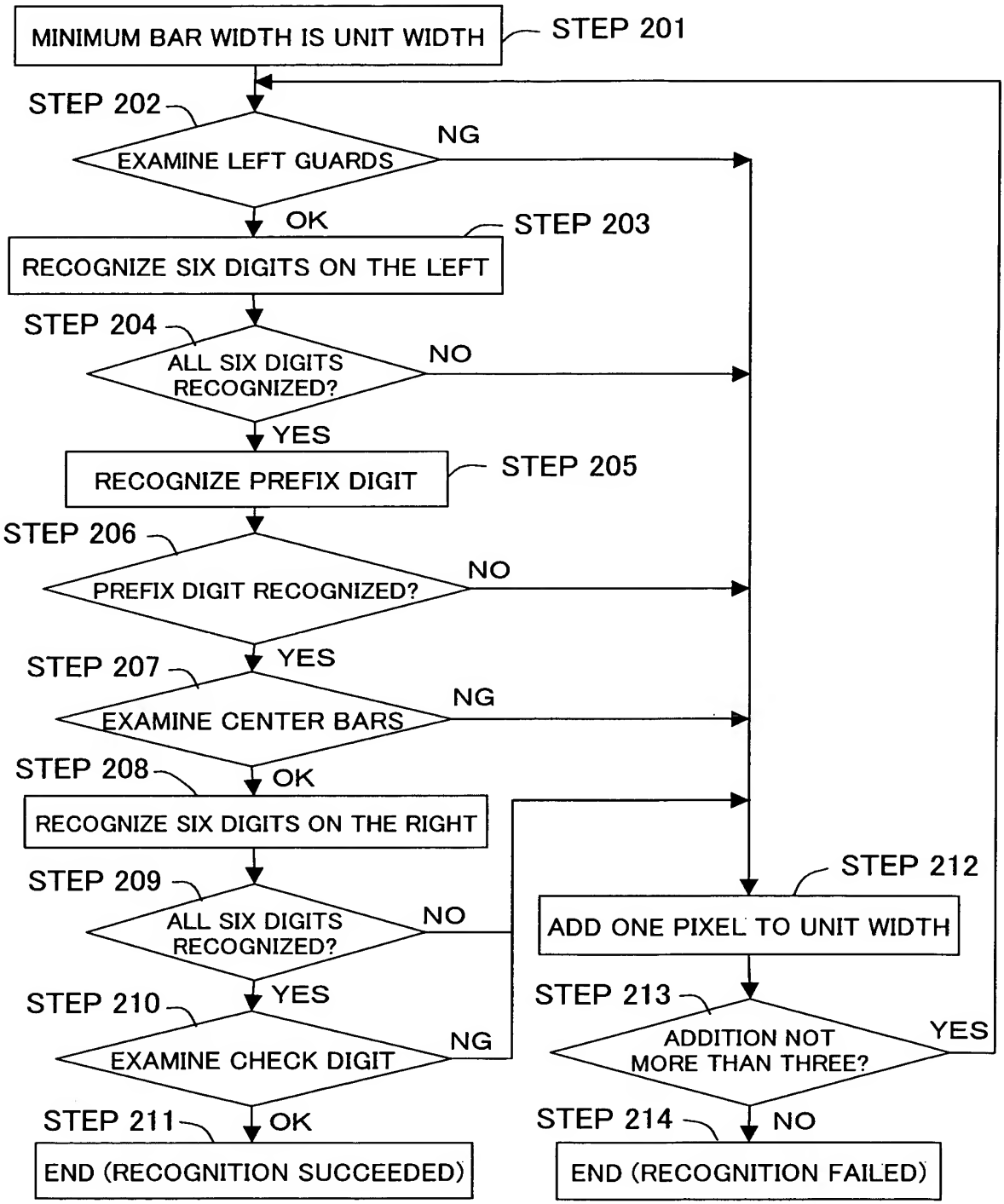

MINIMUM BAR WIDTH IS UNIT WIDTH
STEP 201
STEP 202
EXAMINE LEFT GUARDS
NG
OK
STEP 203
RECOGNIZE SIX DIGITS ON THE LEFT
STEP 204
ALL SIX DIGITS RECOGNIZED?
NO
YES
RECOGNIZE PREFIX DIGIT
STEP 205
STEP 206
PREFIX DIGIT RECOGNIZED?
NO
YES
STEP 207
EXAMINE CENTER BARS
NG
OK
STEP 208
RECOGNIZE SIX DIGITS ON THE RIGHT
STEP 209
ALL SIX DIGITS RECOGNIZED?
NO
YES
STEP 210
EXAMINE CHECK DIGIT
NG
OK
STEP 211
END (RECOGNITION SUCCEEDED)
STEP 212
ADD ONE PIXEL TO UNIT WIDTH
STEP 213
ADDITION NOT MORE THAN THREE?
YES
NO
STEP 214
END (RECOGNITION FAILED)

FIG. 6

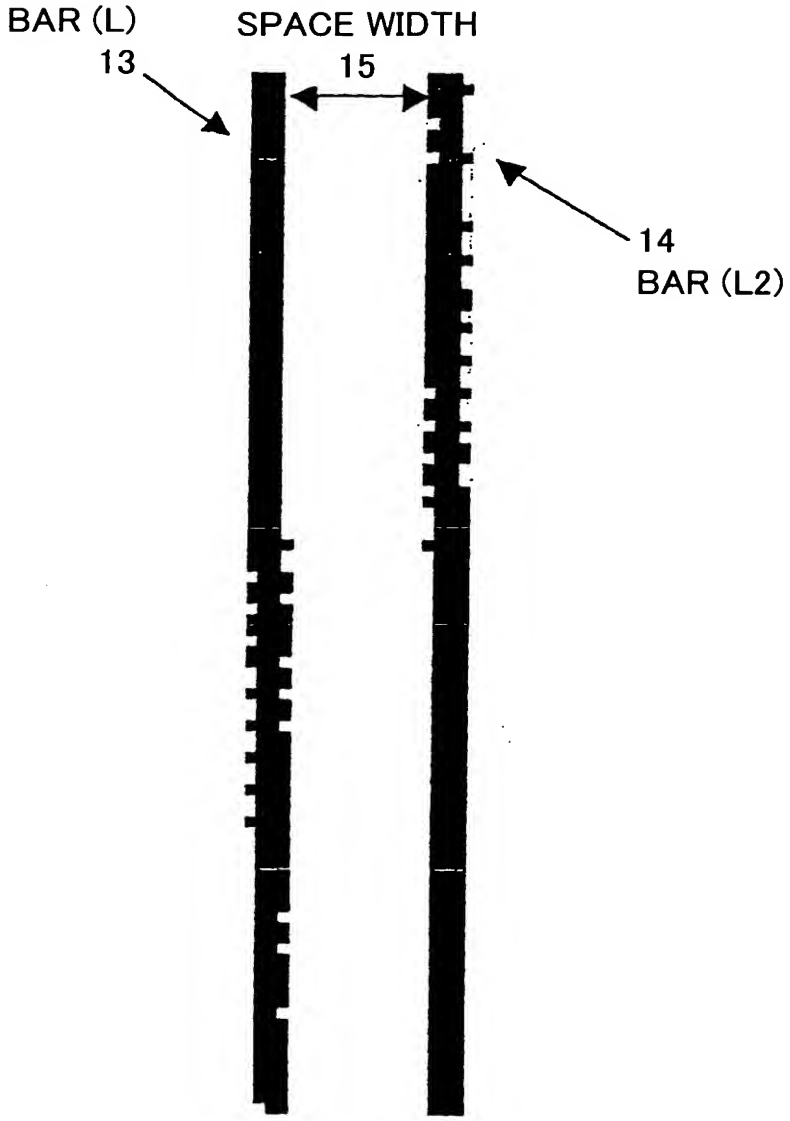


FIG. 7

MAGNIFICATION	ALLOWABLE ERROR RATIO
1	50%
2	70%
3	90%
4	110%

FIG. 8

WIDTH 1	WIDTH 2	WIDTH 3
1	1	1

FIG. 9

WIDTH 1	BAR
WIDTH 2	SPACE
WIDTH 3	BAR

FIG. 10

NUMERICAL VALUE	WIDTH 1	WIDTH 2	WIDTH 3	WIDTH 4
0	3	2	1	1
1	2	2	2	1
2	2	1	2	2
3	1	4	1	1
4	1	1	3	2
5	1	2	3	1
6	1	1	1	4
7	1	3	1	2
8	1	2	1	3
9	3	1	1	2

FIG. 11

	ON THE LEFT	ON THE RIGHT
WIDTH 1	SPACE	BAR
WIDTH 2	BAR	SPACE
WIDTH 3	SPACE	BAR
WIDTH 4	BAR	SPACE

FIG. 12

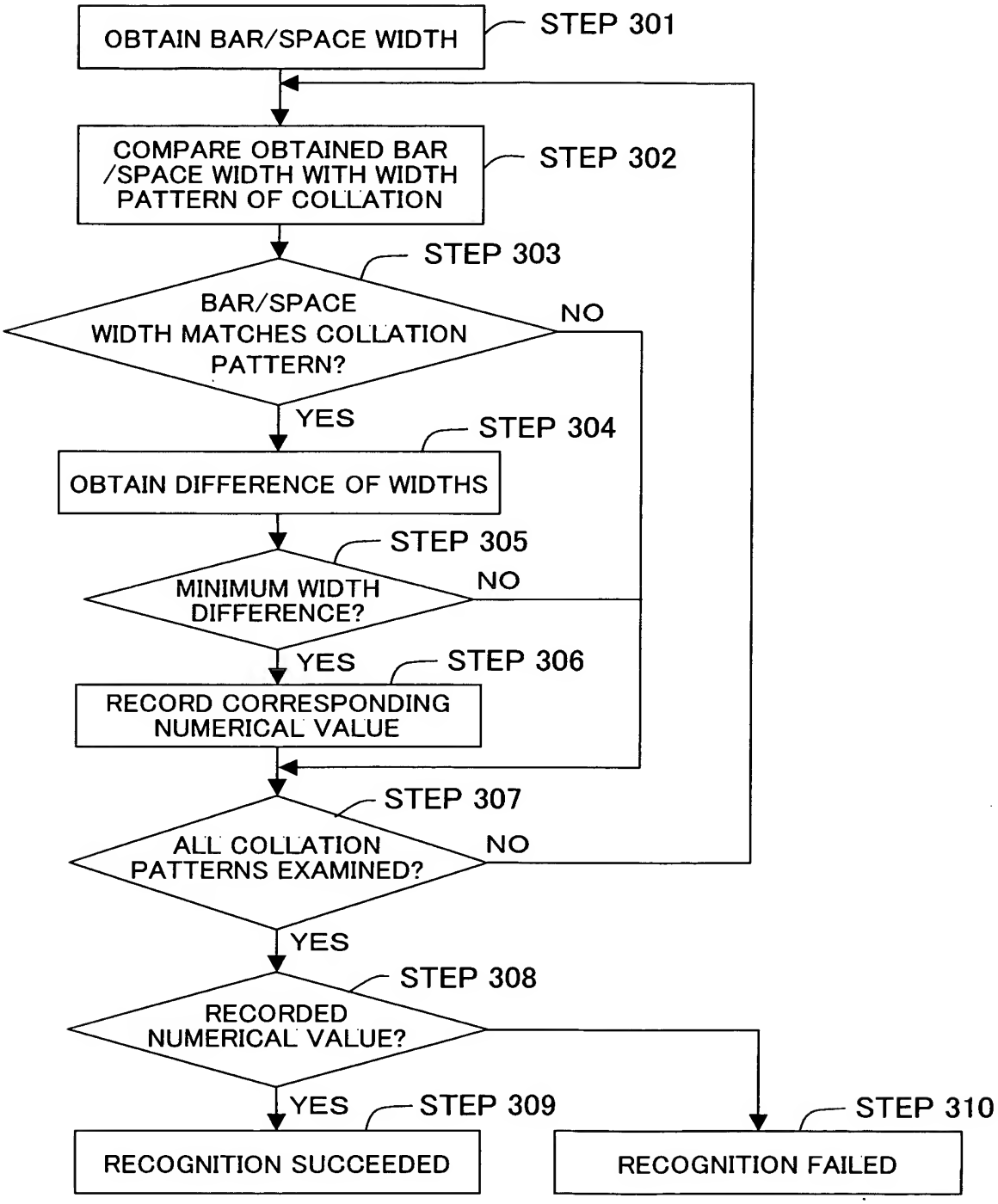

OBTAIN BAR/SPACE WIDTH
STEP 301
COMPARE OBTAINED BAR /SPACE WIDTH WITH WIDTH PATTERN OF COLLATION
STEP 302
STEP 303
BAR/SPACE WIDTH MATCHES COLLATION PATTERN?
NO
YES
STEP 304
OBTAIN DIFFERENCE OF WIDTHS
STEP 305
MINIMUM WIDTH DIFFERENCE?
NO
YES
STEP 306
RECORD CORRESPONDING NUMERICAL VALUE
STEP 307
ALL COLLATION PATTERNS EXAMINED?
NO
YES
STEP 308
RECORDED NUMERICAL VALUE?
YES
STEP 309
RECOGNITION SUCCEEDED
STEP 310
RECOGNITION FAILED

FIG. 13

NUMERICAL VALUE	COMBINATION	NUMERICAL VALUE	COMBINATION
0	111111(63)	5	100110(38)
1	110100(52)	6	100011(35)
2	110010(50)	7	101010(42)
3	110001(49)	8	100101(41)
4	101100(44)	9	100101 (37)

ODD PARITY IS "1" AND EVEN PARITY IS "0". IN PARENTHESES, NUMBER SYSTEM IS DECIMAL

FIG. 14

WIDTH 1	WIDTH 2	WIDTH 3	WIDTH 4	WIDTH 5
1	1	1	1	1

FIG. 15

WIDTH 1	SPACE
WIDTH 2	BAR
WIDTH 3	SPACE
WIDTH 4	BAR
WIDTH 3	SPACE

FIG. 16

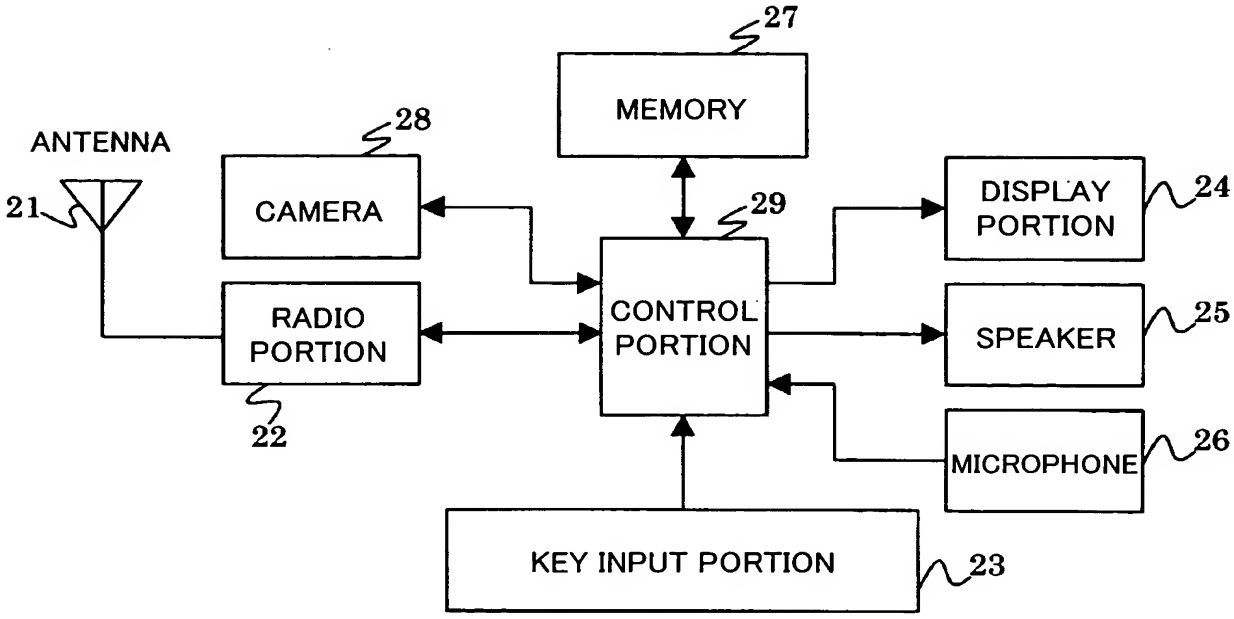

27
MEMORY
ANTENNA
28
CAMERA
21
29
DISPLAY PORTION
24
RADIO PORTION
CONTROL PORTION
SPEAKER
25
22
MICROPHONE
26
KEY INPUT PORTION
23

FIG. 17

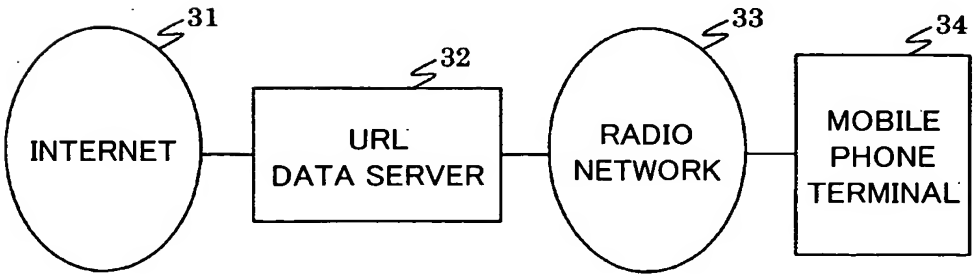

31
33
34
32
INTERNET
URL DATA SERVER
RADIO NETWORK
MOBILE PHONE TERMINAL

FIG. 18

2
5
3
6
7
4
LEFT GUARD BARS
CENTER BARS
CHECK DIGIT
RIGHT GUARD BARS
DATA CHARACTERS ON THE LEFT
DATA CHARACTERS ON THE RIGHT
1
8
4 912345 678904

FIG. 19

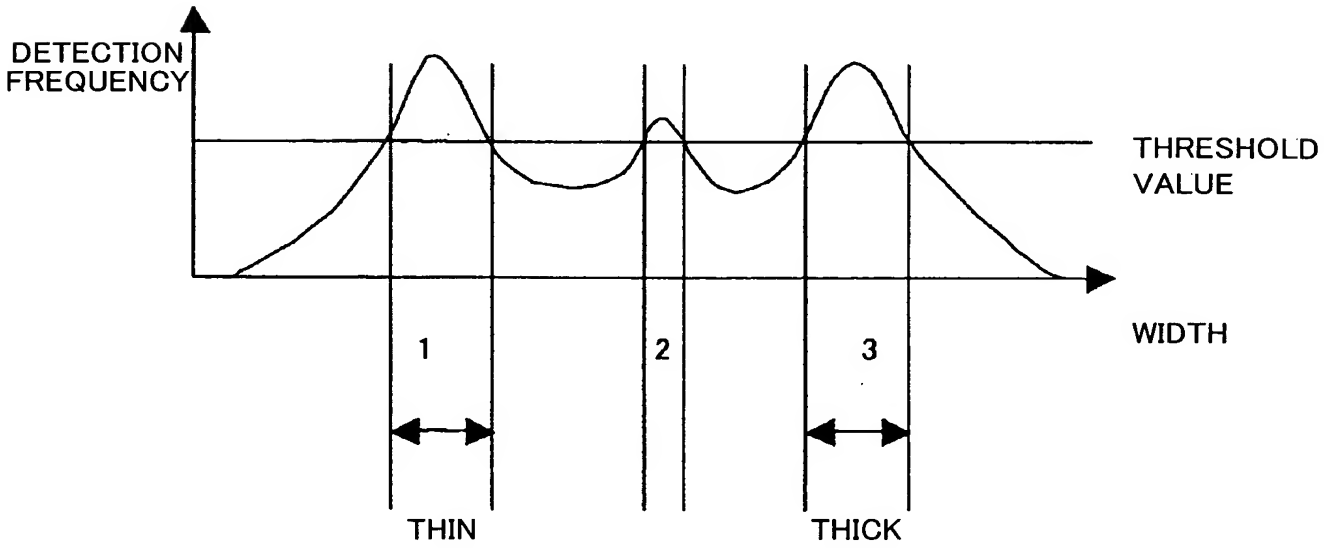

DETECTION FREQUENCY
THRESHOLD VALUE
WIDTH
1
2
3
THIN
THICK

FIG. 20

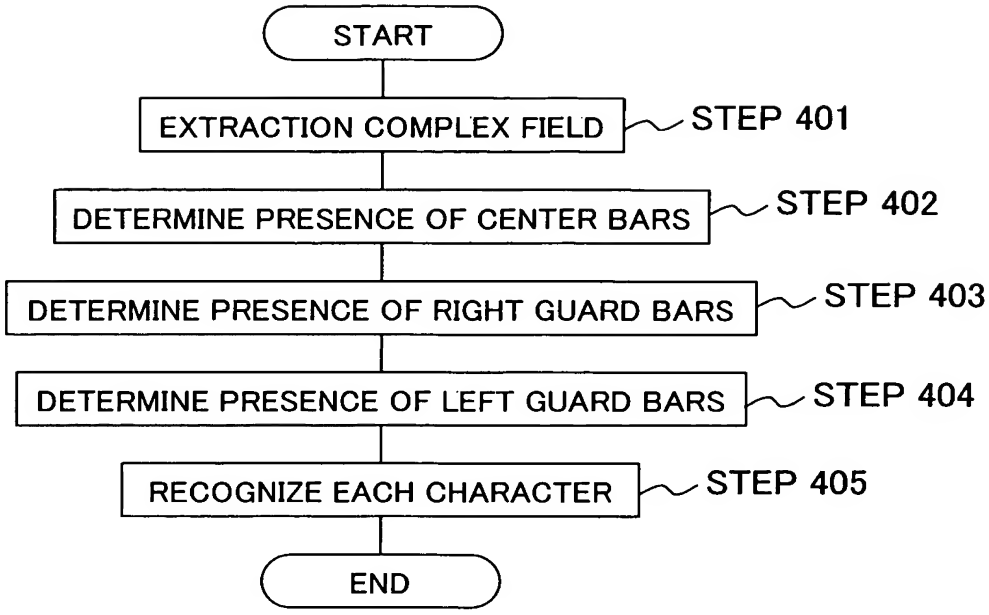

START
EXTRACTION COMPLEX FIELD
STEP 401
DETERMINE PRESENCE OF CENTER BARS
STEP 402
DETERMINE PRESENCE OF RIGHT GUARD BARS
STEP 403
DETERMINE PRESENCE OF LEFT GUARD BARS
STEP 404
RECOGNIZE EACH CHARACTER
STEP 405
END

FIG. 21

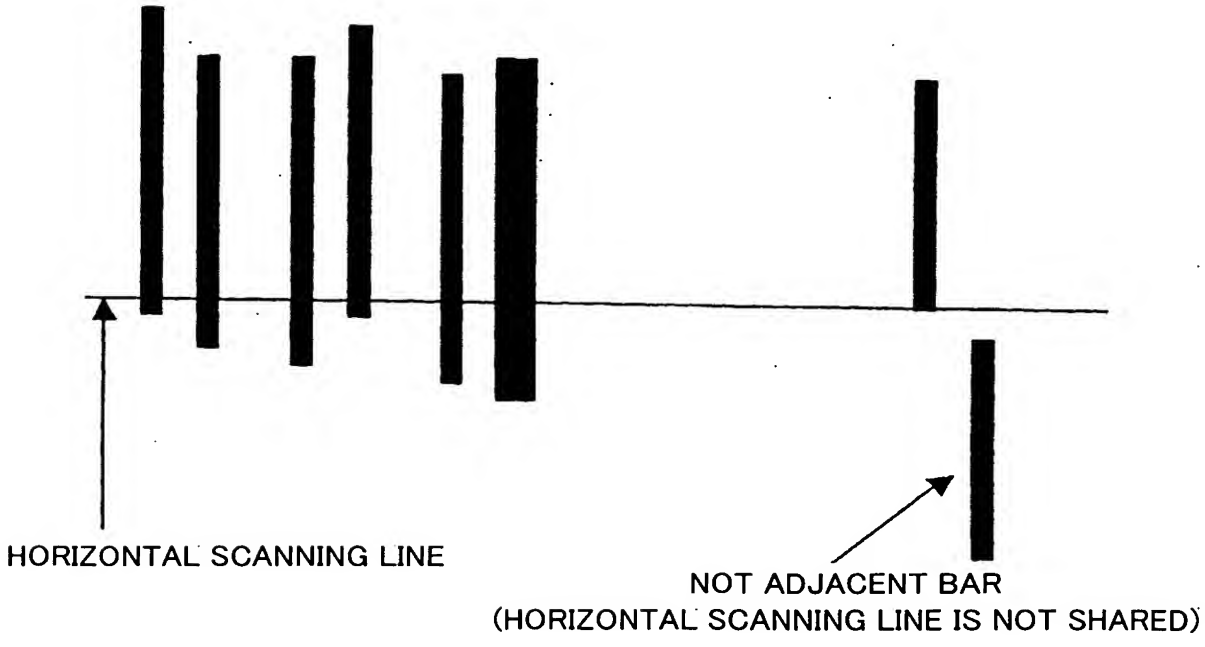

HORIZONTAL SCANNING LINE
NOT ADJACENT BAR
(HORIZONTAL SCANNING LINE IS NOT SHARED)

FIG. 22

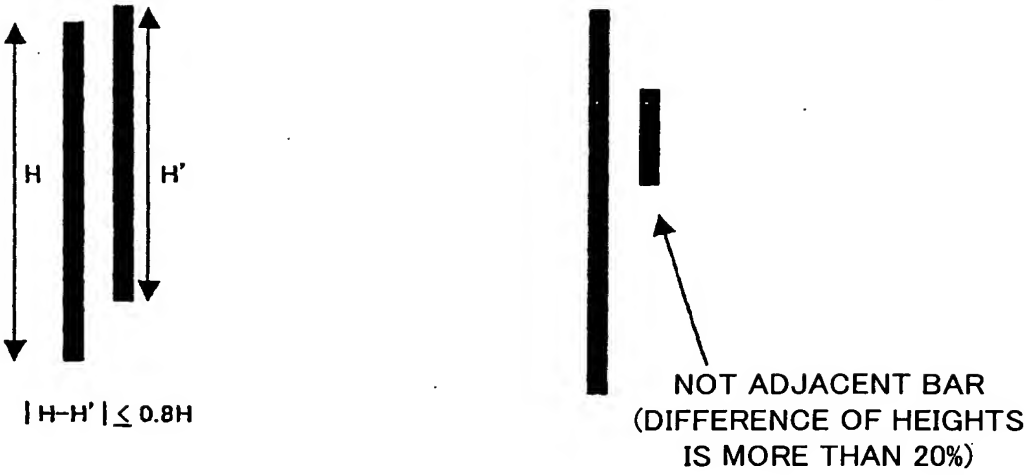
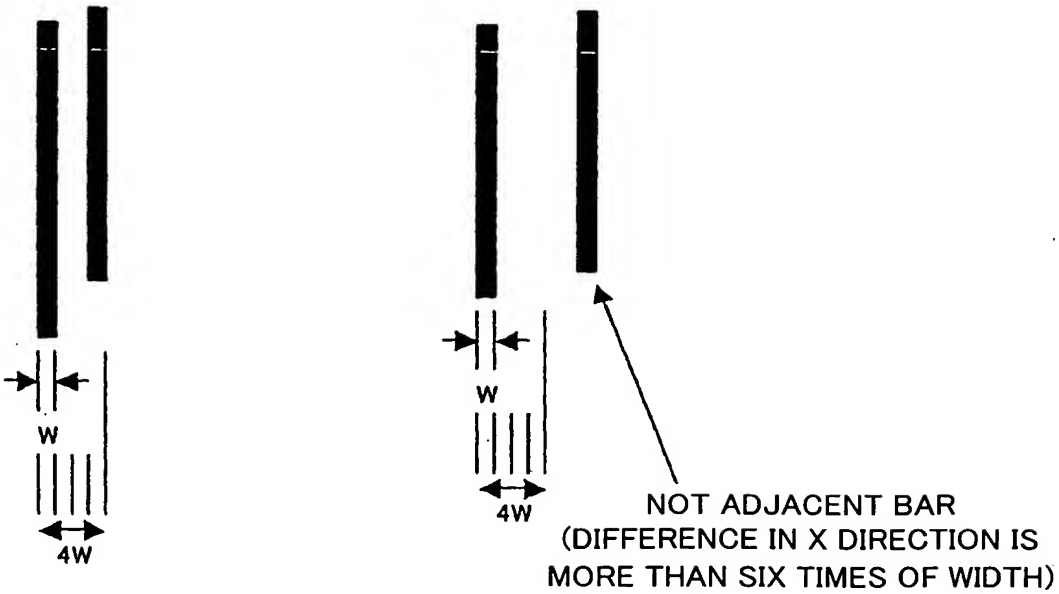

H
H'
| H–H' | ≤ 0.8H
NOT ADJACENT BAR
(DIFFERENCE OF HEIGHTS
IS MORE THAN 20%)

FIG. 23


W
4W
W
4W
NOT ADJACENT BAR
(DIFFERENCE IN X DIRECTION IS
MORE THAN SIX TIMES OF WIDTH)